

## WHAT IS CLAIMED IS:

1. A heat exchanger comprising:  
a shell having an inner chamber defined by an inside wall surface, and  
5 having at least one opening adjacent an end of the shell;  
a tube bundle disposed within the inner chamber and comprising a  
plurality of tubes arranged together;  
a header plate attached to the tubes and positioned adjacent an end of the  
tube bundle, the header plate including an outside diameter that fits within the  
10 inside wall surface to provide a nested attachment junction therebetween.
2. The heat exchanger as recited in claim 1 wherein the inside wall  
surface includes a recessed section that extends axially a distance from an end of  
the shell, and wherein the header plate outside diameter includes an axially  
15 projecting section that fits within the recessed section.
3. The heat exchanger as recited in claim 2 wherein the header plate  
further comprises a lip that projects radially outwardly from the axially projecting  
section, and that is positioned adjacent the shell end.  
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4. The heat exchanger as recited in claim 2 further comprising brazing  
material interposed between the recessed section and the axially projecting  
section.
- 25 5. The heat exchanger as recited in claim 3 further comprising a tank  
attached to the shell adjacent the shell end, wherein the header plate lip is  
interposed between the shell and an end of the tank.
6. The heat exchanger as recited in claim 5 wherein at least one of the  
30 end of the tank and the end of the shell includes a chamfer along an outside  
surface, and welding material is interposed between the tank and shell ends.
7. A shell and tube heat exchanger comprising:

a shell having an inner chamber defined by an inside wall surface, at least one opening adjacent an end of the shell, and having a recessed section extending circumferentially around the inside wall surface and extending axially a distance from the end;

5           a tube bundle disposed within the inner chamber and comprising a plurality of tubes arranged together;

          a header plate attached to the tubes and positioned adjacent an end of the tube bundle, the header plate including an outside diameter having an axially projecting section that fits within the recessed section to provide a nested

10          attachment junction therebetween; and

          brazing material interposed between the axially projecting section and the recessed section.

8.       The heat exchanger as recited in claim 7 wherein the header plate  
15       further comprises a lip that projects radially outwardly from the axially projecting section, and that is positioned adjacent the shell end.

9.       The heat exchanger as recited in claim 8 further comprising a tank  
          attached to the shell adjacent the shell end, wherein the header plate lip is  
20       interposed between the shell and an end of the tank.

10.      The heat exchanger as recited in claim 9 wherein at least one of the  
          end of the tank and the end of the shell includes a chamfer along an outside  
          surface, and welding material is interposed between the tank and shell ends.

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11.      A method for making a heat exchanger comprising the steps of:  
          inserting a tube bundle comprising a plurality of combined tubes into an  
          internal chamber of a surrounding shell, the tubes being connected to a header  
          plate;

30       forming a nested attachment junction between the shell and the header  
          plate by placing an outside diameter of the header plate adjacent to an inside wall  
          surface of the shell;

forming a braze joint in the nested attachment junction by depositing brazing material between the header plate outside diameter and the shell inside wall surface.

5           12.     The method as recited in claim 11 wherein the inside wall surface includes a recessed section that extends axially a distance from an end of the shell, and wherein the header plate outside diameter includes an axially projecting section that fits within the recessed section when forming the nested attachment junction.

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          13.     The method as recited in claim 11 wherein the header plate further comprises a lip that projects radially outwardly from the axially projecting section, and that is positioned adjacent the shell end when forming the nested attachment junction.

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          14.     The method as recited in claim 13 further comprising the step of attaching a tank to the shell adjacent the shell end, wherein the header plate lip is interposed between the shell and an end of the tank.

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          15.     The method as recited in claim 14 wherein at least one of the end of the tank and the end of the shell includes a chamfer along an outside surface, and the step of attaching the tank further comprises depositing welding material between the tank and shell ends.